Assignment 1 - V703 - Winter 2007

11/01/2007

1. This question refers to the factory for MP3 players discussed in the first lecture. Consider the expression for the Extended Net Present Value for the project (given by equation (4) in the notes). Assume first that $P_0 < \frac{1+R}{R}\frac{I_0}{d}$, so that this expression reduces to

$$\text{ENPV} = \left(P_0 + \frac{(1-q)P_d}{R} - I_0\right) + \frac{qI_0}{1+R}.$$

(a) Find an expression for the initial value P_0 for which the ENPV above is equal to zero. Call this the *critical price* for MP3 players and denote it by P^*.

(b) Reinterpret the investment rule "invest whenever ENPV is positive" in terms of how an observed price P_0 for MP3 players compares to the critical price P^*.

(c) Analyze how the critical price P^* changes with the initial cost I_0 and the price variability (the spread between u and d) and use the investment rule of the previous item to conclude how the incentive for immediate investment varies with these parameters.

What happens when $P_0 > \frac{1+R}{R}\frac{I_0}{d}$.

2. Use a binomial tree with 5 periods to calculate the price of a European put option on a non-dividend-paying stock when the initial stock price is \$80, the strike price is 75, the risk-free interest rate is 3% per period, the upward factor is $u = 1.05$ and the downward factor is $d = 1/u \approx 0.9524$.

3. Give a non-arbitrage argument to justify the put-call parity relation

$$c_t + Ke^{-r(T-t)} = p_t + S_t.$$

4. Calculate the price of a European call option with the same parameters as in question 2 and compare the result with the value given by put-call parity.